

# Urban Agriculture

## *Food, Jobs and Sustainable Cities*

2001 Edition

### Chapter 10 Trends in Urban Agriculture

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**Published by:**

The Urban Agriculture Network, Inc.  
A Non-Profit, 501 (c)(3) Organization

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United Nations Development Programme (UNDP)

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# 10

## Trends in Urban Agriculture

Again and again, previous chapters have noted the nature of the resurgence of farming in the city in most regions of the world. In this chapter, we will gingerly consider the significance and possible causes of this resurgence, and examine the larger trends of which it is a component. This resurgence bears reexamination before we begin a discussion of possible strategic options for urban agriculture in the following chapter.

Trends in urban and peri-urban agriculture are distinctly different in different places. In Hawaii, restaurants and markets are filling with locally-grown vegetables and fruits, and thousands of small-scale farmers are rushing to fill the demand.<sup>1</sup> In the Netherlands, integrated livestock-vegetable production systems are being installed inside multistory buildings. Singapore's Agro-Technology Parks are reaping profits and attracting commercial tourists. Farmers' markets in the United Kingdom and the United States are reaching out and helping farmers to produce for them. In West and East Africa, not-for-profit civic organizations are providing direct support and lobbying for government support for city farmers. Cuban and South African governments are providing diverse support and profiting from growing highly productive and expanding urban agriculture food systems.

At the beginning of a new century, the resurgence of urban agriculture is indeed complex. In Asia, for example, urban farming continued its important role throughout the last century. In rapidly urbanizing Asian countries, including Vietnam, urban agriculture is increasing at least as fast as the urban population. In contrast, modern urbanization is reducing its role in some Asian countries. In Hong Kong the share of locally-grown produce is one-half of what it was in the 1980s.<sup>2</sup> Some cities in China have banned certain types of wastewater use for irrigation because of its increasing contamination from heavy industry.<sup>3</sup> In these countries, urban farming is being pulled both forward and backward — in most it is booming, but in some countries it is waning.

Is forecasting possible with the available data and its consequent analysis? The authors find that the needed data are not available. However, based on more than 40 years of cumulative work in the field (extending back to the 1960s), and visits to more than 40 countries and 100 towns and cities on four continents, we are willing to make some educated guesses. Some factors influencing urban agriculture are summarized in Table 10.1. Globally, we are persuaded that the field will continue to expand, and in some countries it will decline. Decline may occur where there has been recent expansion in response to a disastrous economic or social situation. Expansion will occur in response to urbanization, information, policies, and other influences as discussed in this chapter.

**Table 10.1 Selected factors influencing the evolution of urban agriculture in the year 2000**

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*Urbanization*

Population  
Infrastructure  
Land consumption  
Land use and tenure  
Urban-rural links

*Globalization*

Lifestyle  
Information  
Marketing

*Technology*

Hydroponics  
Biotechnology  
Aquaculture  
Energy

*Environment*

Water  
Land and soil  
Climate

*Food security and health*

Scale  
Environment  
Social  
Economic

*Special groups*

Women  
Refugees and displaced persons  
Immigrants and migrants

*Waste management and nutrient cycle*

Heat  
Water  
Organic  
Inorganic

*Research and support*

*Agroterrorism*

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The expansion of urban agriculture over the past 20-30 years provides an opportunity to capture the benefits defined in Chapter 7 and elsewhere in this book. Studies indicate that in most cities and countries, the benefits from production of food, fuel, medicinals, and ornamentals within the human settlement will outweigh the costs. The costs, however, are significant and should not be considered as quick, easy, or cheap to overcome.

Research from the 1980s and 1990s conducted by the (Canadian) International Development Research Centre (IDRC), The Urban Agriculture Network (TUAN), United Nations Development Programme (UNDP), United Nations University (UNU), and others concluded that:

- in some cities, urban agriculture produced over 100 percent of the vegetables consumed in the city;
- in many smaller cities, over one-half of the resident households produced food;
- in a wide range of cities, over one-half of the physical area was being farmed;
- in larger cities, livestock appeared to be more common than horticulture;
- in the majority of countries, the typical urban farmer is a woman; and
- urban agriculture tends to be a more environmentally sustainable form of food production than agriculture in rural areas.

Two reinforcing trends appear to be occurring in both North and South:

- urban agriculture diffuses and grows as a result of the *information revolution*, and is part of *globalization*, and
- urban agriculture is a *counter-trend* as the world globalizes — it occurs as a community or civic activity similar to agriculture in the traditional village or the neighborhood pub or coffee shop.

Both these trends are fired by urbanization, and particularly by modern low-density urbanization. Urban agriculture expands with the growth of a city in a low-income economy as part of the informal and formal economy. And it also expands in a high-income economy at the leading edge of consumer specificity — *not just a melon, but a yellow melon with sweet red meat*.

There appear to be at least four trends that especially call for description, study, and various levels of support:

- locally grown and organic production in economically advanced urban areas;
- higher levels of nutritional self-reliance in low-income towns and cities;
- market production rather than commodity production in current and former socialist nations; and
- adaptation to crisis through urban food production (in a time when crises and disasters seem to be a growth industry).

The trends in predominantly urban developed countries and industrializing nations are distinct from those in low-income, food-short urbanizing countries. There are, however, considerable overlaps or similarities, particularly among the lower-income areas in

diverse settings. We aim to distinguish the differences in this chapter, but this does not mean that there are not common lessons to be learned and tasks to be done.

The elements mentioned in this chapter have largely been discussed in Chapters 2 to 9, and much supporting evidence can be found in those chapters. To minimize repetition, both this chapter and the subsequent one are light on data (statistics and examples). Rather in this chapter, the elements in the previous chapters are reassessed with speculation about the trends they are undergoing in the early 21st century, and their effects during the next 30 years.

Few of the trends identified in this chapter, both favorable and unfavorable to the development of urban agriculture, are well defined. Much research is needed to quantify and justify them. Many professionals and students are carrying out a wide range of studies. Networks will ensure that research findings will be put to use as soon as possible. Still, much of the knowledge produced by the research to date remains fragmented, and hard data on the trends in urban agriculture, especially global trends, remains limited. As a result, this chapter is necessarily impressionistic. It will be up to future researchers to review the assertions and hypotheses made here and test them.

## Urbanization

### *Population*

The world population is now 50 percent urban. The least urban continents, Africa and Asia, are rapidly urbanizing — in Africa, from one-fifth in 1970, the urban population increased to one-third by 1995, and is expected to exceed one-half around 2020.<sup>4</sup> The available data indicate that urban agriculture is growing at least as fast as urban population, and in many countries considerably more rapidly.

In some countries and states, urbanization is accompanied by the appearance of ethnically diverse cities with their diverse food demands. California is a leader, with over one-half of its urban population having recent Latin American, Asian, and European connections.<sup>5</sup> The rural agriculture system is less adept at responding to such diversified product requirements than are the smaller urban production units closer to markets.

The increased negative impact of epidemic diseases on the population of many countries is likely to be significant for many years to come. It is predictable that there will be increasing millions of people in their prime years who will either die or become unable to maintain or take up agricultural work, whether in urban or rural areas. Malaria and AIDS are the most prominent of these demographic change agents. Increased resistance to antibiotics is another significant factor. Russia and some African countries have seen a century-long trend to longevity reversed. Beyond this, there are indications of the beginning of a slowdown in demographic growth in several world regions.

Assuming a curb in demographic growth, will the size of the rural and urban food markets be smaller? Will urban or rural agriculture bear the greatest impact of future patterns of disease, health, and mortality? Will there be a reduction in the consumption of natural resources as populations in some countries, especially in Africa, live a shorter life? Will there be a slowdown in urbanization? These and other questions are yet to be assessed for their impacts on urban farming, yet they provide background to the

following discussion. Planning and research for urban agriculture must consider these questions.

### ***Urban-Rural Links***

At the beginning of the 20th century, the rural-urban links in the food systems of industrialized countries were dominated by the railroad and animal-drawn carts. Milk was delivered to the city by train and delivered door-to-door by horse.<sup>6</sup> Most market information flowed the same way. It was a time of rapid change in urban-rural relationships — internal combustion engine, telephone, electricity, cold storage, and the bicycle — changes that would soon revolutionize this system.

At the beginning of the 21st century, we face a similar unknown future in urban-rural relationships, with special implications for farming in the city.<sup>7</sup> Rural economies are becoming dominated by commodity agriculture and industry, rather than mixed agriculture. Urban economies are being taken over by the information economy. The change in urban-rural links present a puzzle to today's urban and regional food system theorists and managers. On the one hand, the prevalence of rural poverty suggests reinforcing the role of rural food production for the city as a source of income for the rural population. On the other hand, however, food insecurity, poverty, health, and environmental issues within urban areas suggest that urban agriculture, at least in the near term, will become increasingly significant to the food system.

Chapters 1, 4, and 6 presented the changing nature of the rural-urban interface. Today, the changes are markedly different for developing, industrializing, and developed countries. In low-income countries 50-80 percent of the population is rural and the majority is engaged in agriculture. Rural poverty is more prevalent than urban poverty. Typical industrializing countries are experiencing a rapid change from small-scale to large-scale (global) agriculture in rural areas, in many cases supported by government. In representative developed countries the rural population is less than 25 percent, with less than one-fourth of that percentage engaged in agriculture. Poverty is moving from smaller towns and cities to larger cities.

A caveat is necessary — in this age of the information revolution, the Internet is becoming more ubiquitous than the telephone or paved highway, thus the rural-urban divide is shrinking everywhere. At the same time that the perception of city farming as a contradiction in terms is waning, 21st century functions such as industrial production are moving to the countryside.

Food system interventions, whether by local or national governments, may appropriately give top priority to the requirements of the small-scale entrepreneur. Both nutrition and price will be important considerations in such interventions. Especially in low-income countries, the GDP effect of shifts from rural to urban agriculture may be a significant indicator. In middle-income countries, the rate of decrease in the number of farms as they become larger will have major social effects on rural families. This will promote more rapid urbanization, typically in advance of adequate infrastructure.

Developed-country agriculture is notable for the decrease in rural farmer income and a growing number of small-scale urban farm enterprises. Policies and programs may well

be focused on supporting the burgeoning urban agriculture sector and preserving as many rural farms as possible without damaging the new urban farming industry.

As rural populations continue to move to ever-larger urban areas, the fewer remaining rural farmers are likely to become more specialized and productive (notwithstanding the aforementioned effects of diseases). As rural agriculture trends toward industry and commodities, its nutritional role is likely to become less well fitted to the needs of urban food security. This may be particularly true for the needs of the urban low-income family and community. Rural agriculture may provide the carbohydrates, but not the equally essential protein, vitamins, and minerals .

A primary aspect of the difference between the 1900 and 2000 urban-rural links is that today information flow is much more efficient. It may be reasonable to forecast that in the next generation urban and rural leadership will work more closely to rationalize the ingredients that enter into each slice of the food system pie. For instance, waste heat and carbon dioxide from office buildings and retail outlets will be used as an input to year-round greenhouse vegetable production in town. On the rural side we may speculate that beer and chip production will move closer to rural hops and potato fields, as has happened in other industries. It is becoming clear that the urban and rural economies are moving ever closer while each is developing emerging specialties.

### ***Land Use, Tenure, and Patterns***

During the decade of the 1990s, cities grew in such a way that urbanized space expanded dramatically, although there were fewer people on each hectare or acre of urban space. The spread of highways and motorized vehicles between 1950 and today, and the more rapid spread of low-cost telecommunications since 1975, has led to cities that are less concentrated, with much more open space, land, and water available to agriculture.

The United States appears to be a leader in this trend, and it may be a harbinger. The Census Bureau found in 1995 that urban expansion in the previous decade had ‘built out’ or converted rural space to urban at a density of one person per acre (2.5 per hectare), whereas in 1940 the country’s urban density on average was 10 people per acre (25 per hectare). In the nine-county Chicago metropolitan area, the 1980s saw a 4 percent population growth and a 40 percent areal expansion.<sup>8</sup>

At the same time as towns and cities are spreading themselves more lightly over the land, cities are changing functions and land uses. Regional airports are replacing seaports. Computer memories are replacing warehouses. Furniture manufacture is moving from the vicinity of the railroad yard to the edge of the forest. As a result, from Calcutta to Chattanooga, land close to the center of cities is becoming available, on an interim basis, for agriculture. Citing Chicago again, in 1998 it had 70,000 vacant lots.<sup>9</sup>

A pattern was established in Europe and its colonies during the late 19th and most of the 20th centuries of keeping the town and city free of agriculture. This aesthetic and philosophical concept was expressed in health codes, subdivision regulations, and zoning. Zoning began as ‘restrictive covenants’ designed to keep separate residential, industrial, and agricultural land uses. The principle of land-use segregation contributes to low density and inefficient urbanization. Urban agriculture is an ameliorative activity of idle or under-used space, as discussed in Chapter 4 and elsewhere.

Our expositions in Chapter 5 have made the point that urban agriculture is less dependent on fertile soil than rural agriculture. Space for food production in the next 30 years, near the center and at the growing edge of cities, may be fertilized with urban waste rather than being dependent on nature's gift of fertile soil. A new principle for urban land-use regulations that considers natural resource conservation, the urban food system potential, and the need for healthy environments for everyone, urgently requires research and development.

The relationship between using land for urban agriculture and management of urban development varies widely from region to region and country to country. There is a trend toward greater permissiveness for agriculture in urban places. During the economic crises of the mid-1990s, Malaysia established a national policy and program favoring urban agriculture.<sup>10</sup> A few years earlier Romania established a similar program. The result was a production jump in urban places from 16 to 26 percent of the country's food in six years.<sup>11</sup> We have previously cited a similar dramatic change in Harare, Zimbabwe. The Toronto Food Policy Council, a government agency, has set a goal of producing 25 percent of the city's food needs within the metropolitan area.<sup>12</sup>

The location of agriculture in the city is influenced by land-use regulations, the real estate market, and land tenure. In Europe and North America, perhaps the greatest influence is legal — zoning, subdivision regulations, building codes, or health regulations. In contrast, in many low-income countries, urban expansion — both building and farming — takes place through extra-legal means, including squatting. Agricultural landlords build fences and hire guards to protect their land from occupation. Often this means farming the least appropriate or suitable sites. These twin patterns appear to be continuing in parallel.

At the same time there appears to be a beginning trend — melding agriculture as an urban land use with all other urban land uses. In countries as diverse as India and Denmark, local government is actively making land available on a lease basis to urban farmers.<sup>13</sup> City farming as a land use will predictably be more and more dependent on a partnership between public and civic organizations.

These few paragraphs profile only some of the dramatic changes in urbanization (both in population and space) during the recent past, many of which seem to have favored urban and peri-urban farming. Some of these factors may already have had their greatest impact. Others seem likely to continue for many years.

### **Globalization and Localization**

The concept of *locally grown* is replacing our parents' concept of *home grown*. Food buyers from the lowest to the highest income are increasingly asking and insisting on knowing where food was produced and preferring locally-grown produce over other products. Recent surveys in New York found that retailers and consumers were willing to pay a premium (5-25 percent) for locally-grown vegetables.<sup>14</sup> Similar results were also found in Iowa. In France, national legislation has temporarily banned the building of supermarkets, to the benefit of smaller retailers more readily connected to local (urban) producers. In eastern Europe there is a return to locally-grown food production, following the trend for most of a century of centrally-directed food systems.<sup>15</sup>



Agriculture, just like textiles and automobiles, is now a global commodity industry. The globalization of the 20th century, following the railroad and steamship revolution, is being trumped by globalization driven by the information revolution. Urban agriculture has been accelerating globally at the same time as the information revolution was getting underway. Some of the rapidity of urban agriculture's growth is due to improved communication.

Global trade clearly favors large-scale, rural-based agricultural systems. At the same time, the information revolution that drives it in some ways, favors the small-scale urban and rural agriculturist. These are parallel and linked trends. Improved information links permit hourly communication between producer and seller, and between urban and rural producer. Decisions about what and how much to produce when will not only improve, but be more efficient among rural and urban growers, to the benefit of both. Improved communications are democratizing decisionmaking and financing, and there is less need for top-down decisions. As decisions move down the hierarchy they will become more integral to the community, and community-based agriculture may reappear as it once was in the village.

The information revolution favors the small farmer whether urban or rural. In an urbanizing world, however, urban agriculture seems likely to be the favored beneficiary from this revolution (world wide web, cellular phone, accessible databases, expert systems), because the urban resident tends to be *more connected* than the rural resident. This advantage may be temporary, however, as this revolution reaches the village. Case studies abound of the 'little guy' using the Internet to gain knowledge of markets and technology.

### **Lifestyle**

Peering into the future of urban agriculture requires being aware of two parallel lifestyles, at first seemingly contradictory but more likely simply two expressions of changes in modern life. First, consumers, particularly in wealthier countries, are demanding to *see the farmer's face* on their food. This lifestyle demand favors production close to the dinner plate and therefore production within or at the border of the urban settlement. The emergence of community-supported agriculture was one reflection of such a desire. This is one of several major evolutions in eating habits that are likely to bear on urban agriculture worldwide.

Second, all over the world more and more people eat an increasing number of their meals outside the home, and purchase more of their meals ready-made. Many homes in Bangkok, Thailand in the 1980s were even built without kitchens because the residents would rely on street food.<sup>16</sup> Certain regional diets influence the eating of millions outside their country of origin, ranging from the praises heaped on the Mediterranean diet, to the popularity of Chinese food around the globe.

The lifestyle trend to 'fast food' is driving toward fewer — but larger — agricultural food production units. Frito-Lay (chips) in 1996 had more potato producers in Turkey than in the United States. The Turkish market was 3-4 percent of the American market, but the transnational corporation had not yet organized its production lines to its convenience.<sup>17</sup>

There are two trends — a greater role for healthy food, and a greater role for fast food and junk food. The former favors smaller-scale local farmers, while the latter favors large corporate operations. Urban farmers can also benefit as providers to the informal street food trade. Still, not enough is known about what these two trends will mean for urban agriculture. This is an important question that remains to be answered.

### **Marketing Trends**

Beginning in the mid-1930s and continuing through the mid-1970s, there was a North American-led trend toward vertically integrated agriculture/food corporations. In the second half of the century, these mega-corporations encircled the globe.

During the final quarter of the century, however, a countertrend was gaining momentum. Traditional cultures and countercultures alike began to reestablish food systems better fitted to their lifestyles. Cases in point include the Prince of Wales establishing an organic farm on his estate, and Swedish industrial corporations supporting sustainable communities, including community food security. Sales of organic produce in the UK increased 55 percent from 1999 to 2000.<sup>18</sup> On the other side of the globe, we have Auroville in India and several Ecovilles in Africa.

Community-supported agriculture began in Japan in the 1970s, jumped to Switzerland in the 1980s, and is now spreading throughout Europe and North America. Farmers' markets increased 40 percent from 1994 to 1996 in the United States.<sup>19</sup> They are spreading equally fast in the UK.<sup>20</sup> In California, the supermarket lobby has presented legislation to the state assembly to make the operation of farmers' markets more difficult — surely a sign that they are being taken seriously as a competitor.<sup>21</sup>

Farmers' markets — once a week, once every 10 days, twice a week — are a global phenomenon now making a comeback in the wealthiest countries, as a logical continuation of and stimulus for the reemergence of urban agriculture. Growing and marketing locally-produced food is further advanced by sales to street food vendors and restaurants rather than to retail food outlets because these are in effect wholesale transactions with lower overhead.<sup>22</sup>

Marketing locally-grown food varies tremendously as a share of total market from region to region, related to the economy and the culture. The range is possibly from 5 percent in the United States to 50 percent in some sub-Saharan countries. This is a trend well worth researching at the start of the new century.

In Dar es Salaam, a GTZ survey found that 90 percent of the green leafy vegetables consumed in the city were grown in the city. Most went from market farmer to retailer to consumer within sectors of the city.<sup>23</sup> Case 5.3 in Bogota, Colombia presents another trend in direct marketing, wherein the producer and retailer sit on the board of the corporation and jointly decide what will be produced when. This trend and others are also supported by new communications systems.

City farmers are adapting the principles of fast food delivery (think pizza) to capture market niches waiting to be tapped. Small urban entrepreneurs such as Mary Corboy in Philadelphia, USA,<sup>24</sup> and the Silwoods in Auckland, New Zealand (see Case 3.3), offer delivery of their lettuce and other vegetables within the hour to upscale restaurants, and

neither can produce enough to meet demand. They deal directly with chefs. Conversely, restaurant owners and chefs such as Judy Wicks in Philadelphia and Jimmy Schmitt in Detroit rely on carefully constructed grower networks in their regions to supply them with the vegetable and animal products required for their innovative cuisine. These products would otherwise be difficult to acquire.

Some trends in marketing, especially related to the emergence or spread of technologies, may favor large-scale agriculture in rural areas, or at least cut back some of the advantages urban agriculture now has. The trend to shipping from regional airports over seaports provides a new entry to regional and global markets for some rural producers. Irradiation of milk and other products eliminates the need for refrigeration and permits longer supply lines. The possibility of cheap energy by harnessing newer technologies, improved energy efficiency of equipment, and improved infrastructure (particularly roads) will reduce the urban farmer's advantage of proximity because the cost of access from rural areas will decline.

Global food marketing favors large-scale rural production in a number of product lines. Thus Bangladeshi shrimp are eaten worldwide, as are Arkansas chicken products. Food in a box, such as breakfast cereal, requires large-scale farming and processing. The information revolution enables large corporations to integrate their production, processing, and distribution in a manner never before possible.

In some circumstances, it is the consolidation of supermarkets that enables an oligopoly to develop, resulting in much higher prices to consumers (see recent case of eggs in California).<sup>25</sup> In some applications and product lines, urban agriculture is gaining a competitive position with rural agriculture in some countries and regions. The urban grower can capture as much as 50-75 percent of the retail price, depending on the marketing system, whereas the rural farmer may receive more typically 15-40 percent.<sup>26</sup> This can be accomplished by reducing or eliminating the role of the middleman by controlling marketing channels between producers and consumers. We believe that development of multiple marketing channels will in most cases favor urban agriculture. Whatever point in the food marketing system may become a 'choke point', the development of multiple marketing channels is inevitably favorable to urban agriculture.

## Production Technologies and Systems

The technological revolution now underway can favor both rural and urban agriculture. As just one example, while global positioning information systems that use satellites are increasing the efficiency of rural production, in the future, this technology may be refined to benefit urban producers.<sup>27</sup>

The development of genetically modified organisms (GMOs) (crops) has so far principally benefited large-scale rural production, particularly soya and maize. The future of GMOs and any direction they may take in the future will probably depend more on public policy than on technical innovations. For example, the modification of soya to be resistant to the weedkiller Roundup and the development of maize and soya that resist insect pests have raised grassroots, academic, and political objections in Europe, India, and elsewhere. The long-term impact of GMOs on small-scale urban farmers is difficult to predict.

Renewable energy is very slowly gaining a share of the agriculture market from petroleum. The use of wind, sun, and biogas energy, which in the mid-20th century was largely rural, has recently moved to urban and peri-urban farms. Greater production intensity per unit of space makes the use of self-produced heat and energy more feasible for the urban farmer. The easier access to urban waste as a source of energy is an advantage that is not likely to be lost.

Urban agriculture is closely identified with an increase in production intensity. On the positive side, this increase allows a more efficient and effective use of resources and fosters development of technological innovations. On the negative side, it increases the possibility of polluting soil, water, and air. Most typically, intensification is favorable in horticulture and unfavorable in livestock.

The on-going revolution in soilless production such as hydroponics in Latin America and aeroponics in Singapore may benefit the producer who is closer to the market. Until now, it has been primarily an urban means of production. Whether it remains so is an open question.

The 3,000-year-old technology of irrigation is in rapid transformation. As we move from trench to pipe, sprinkler, and drip irrigation, the amount of water needed per unit of production continues to decrease, particularly in space-constrained urban areas. Another advantage to the urban producer is the opportunity to use urban wastewater. In many countries, the urban producer who has *not* invested in a less-efficient technology will have an advantage.

There is a revolution in the agricultural use of man-made structures. The late 19th century saw the widespread introduction of heated and unheated greenhouses (glass houses, hot houses, cold frames) in peri-urban areas. These proved too costly to compete with tropical production in the second half of the 20th century. Today more efficient plastic houses are changing the urban landscape worldwide, as can be witnessed along the Lebanese and Spanish coastlines. They are much cheaper to build, maintain, and heat, and can easily be moved to another location.

Fish and many other aquatic crops are being produced in unprecedented amounts in man-made tanks and ponds.<sup>28</sup> This aquaculture technology has until now been predominantly practiced in peri-urban locations, close to markets. On the positive side, more fish in the diet is good for health, but some methods of fish farming are damaging to the environment. There is a 'win win' solution — organic and wastewater fish production at small and medium scale, as discussed in Chapter 5.

Urban and peri-urban locations would seem to offer advantages to smaller-scale production in cages, sheds, and other enclosures. This includes all small livestock and poultry as well as zero-grazing of some large livestock. Rabbits and quail are among the leaders in rate of growth. Large-scale (sometimes called factory or feedlot) production of veal, beef, poultry, and pork may in the future be determined on the basis of access to both feed and markets. Some will be near the railroad, others near the maize field, and still others near the market. Urban and peri-urban locations would seem to offer advantages to smaller-scale cage production.

In many of the world's largest cities and developing and recently industrialized countries, livestock production is more common than horticulture within the central area.<sup>29</sup> Urban animal husbandry is tied to a number of other systems. Links include manure from central areas to fringe horticulture, sewage to fringe areas to produce fodder, and fodder trucked to the central city to feed livestock. In some situations, the highest and best (safest) use of select urban waste is to fertilize a fodder crop.<sup>30</sup>

Global warming has increased the growing season by close to a week in much of North America and Europe since 1970. The effects of this trend, which may accelerate, remains to be seen, but it is likely to reduce the need for expensive investments in climate modification to stretch the season, investments that are more commonly found in urban areas.

New packaging technology promises to increase shelf-time of perishable products, favoring the distant producer. Improved energy efficiency will benefit the large remote producer and vertically integrated agribusiness. And last but not least, the use of pesticides and other chemicals that reduce the need for labor, favor the less labor-intensive rural monocropping, particularly as rural populations dwindle.

### **Environment and Natural Resources**

The 1960s ushered in a period of increased awareness and concern about the relationship between people and nature. The growth of urban agriculture and the increased study and recognition of environmental limits to growth have been parallel.

The wide dissemination of the concept of sustainability in rich and poor countries may be a supporting factor in the increasing acceptance of urban agriculture. Despite the lack of research support, at this writing such an argument is compelling and can be of great value as we look to the future.

In a village, town, or small city, people could establish a connection to the soil and nature during their lifetime. But in a large city or megapolis, residents have lost or are losing their connection to the reality of food production. Much of the latest human generation (born in the 1980s) is unlikely to ever know where food comes from beyond the retail and fast food outlets. Can this trend be reversed by the return of agriculture to the city?

It makes sense during the 21st century to favor sustainable (waste-based) urban agriculture over soil- and petroleum-based rural agriculture in order to retain a livable environment. The rapidly growing sustainable agriculture movement may be the harbinger of such policies and programs.

A continuing intensification of urban agricultural practices is one clear trend. Less clear though, is the overall impact of such a trend on the urban environment. Some intensification (such as the broad growth of waste reuse, both solid and liquid) is largely favorable to urban ecology. Others, such as new wells drawing water from an aquifer for irrigation, are not.

Urban food/fuel production is at the epicenter of the global debate about ecologically sustainable development. Research for the 1992 Earth Summit found that 75 percent of the natural resources that we harvest or mine from the earth are shipped to 2.5 percent of

the earth's surface where we live (cities).<sup>31</sup> About one-half or more of this resource exploitation is for food. Rural agriculture is the largest single contributor to runoff erosion and river degradation.<sup>32</sup> It is clear to many that reduction in per capita resource consumption is a key to the sustainability of our civilization.<sup>33</sup> A proper estimate of the possible benefits of urban agriculture as a means to reduce conversion of resources to waste has yet to be undertaken (see discussion of the nutrient cycle in Chapter 1).

During all of the 20th century the countries furthest from the equator have been getting wetter and those closest to the equator have been getting drier.<sup>34</sup> At the same time, the fastest population growth and urbanization rates have been closer to the equator. The diminishing water resources per capita in the warmer areas will reduce the capacity of rural areas as a whole to produce food. Recent river engineering works in these areas have in many cases worsened the problem rather than ameliorating it.

As the tropics and semi-tropics urbanize and grow drier, and because urban agriculture tends to use water more efficiently, we might conclude that urban agriculture of necessity will advance, given appropriate research and education. It will continue to gain in its current advantage because urban agriculture is more capable of reusing water for the second, third, and tenth time. This will be a challenge that urban farmers have to face. Will they meet that challenge?

Large-scale row monocropping contributes to erosion and soil depletion through wind and rain. FAO and other organizations have noted soil depletion in the majority of countries, particularly tropical countries in sub-Saharan Africa and elsewhere. Urban agriculture is better adapted than rural agriculture to producing crops using little or no soil. It has also developed better means to enhance soil. It is predictable, all else remaining equal, that urban agriculture will compensate in some markets for some of the continuing losses in rural agriculture as soil is exported to the sea.

## Food Security and Health

### *Food Security*

The 20th century witnessed a widespread commitment by government and civic organizations to end hunger. During the last 15 years of the century a new concept — food security — began to replace 'ending hunger'. This new concept reached global consensus at the World Food Summit in Rome in 1996. Rather than focusing solely on maximizing production, it recognized that security in the food supply of urban residents must at all time ensure physical, social, and economic access to food by all.<sup>35</sup>

As discussed in Chapter 7, food security must be measured at all levels, from the individual to the national or regional level. We are accustomed to considering hunger at the individual level and food security at the household level. In considering the possible future benefits of urban agriculture to ensure food security, higher levels of social organization and wider geographic areas must be considered.

There are various social theories to support the concept of *household food security*. A properly functioning family or household is commonly perceived as being altruistic and acting in accordance with a concept of common good. Our daily food is given a high priority in any economy of scarcity.

According to the International Labor Organization (ILO), food production — rather than other productive activities — is more likely to be taken up in the city by women, youth, and the aged. Research that largely began in the 1980s continuously finds that more urban households than ever previously reported are engaged in food production. In Tanzanian cities, it is over two-thirds of all families and in the United States over 20 percent. We expect this trend to continue at diverse rates in most economies.

*Community food security* is a concept as old as human settlements. It applied to villages at its origin, and thousands of years later, it applied to walled towns. Today, community food security refers most commonly to a neighborhood, town, or city. Food policy councils are concerned with the food security of a metropolitan region. Community-based organizations enhance the food security of their families, friends, and neighbors, and city councils are devising means to create a food-secure city. Community food security holds that malnutrition and hunger are a symptom of a systemic failure and that the best solution is to fix the system as close to the failure as possible, i.e. community-based, civic, or urban agriculture.<sup>36</sup>

A program aimed at community food security focuses on those who have the greatest food insecurity. Rather than being dependent on increased earning power and subsidies for the poor, it empowers women, youth, and the aged to produce, process, and distribute good food directly. It exploits the potential of idle hands in combination with idle land, consumer waste, and wastewater.

In a 21st century urban world, the concept and strategy of food security will both pressure and enable urban communities to move into food production and processing. New indicators are being created and used by researchers in the fields of nutrition, health, city planning, and agriculture to measure food security and define enabling and hindering policies and programs.<sup>37</sup>

*Global food security* will predictably be largely the result of increasing agricultural yields per unit of space. Food security for the less well-to-do will more likely depend upon their own actions to increase annual family income, as well as plan and manage their communities to produce, process, and distribute appropriate food within the community.

The ultimate question is: Will the increasing contribution of urban agriculture to food security be able to keep up with the ever-growing demand for food as the number of urban poor and food-insecure people continues to mushroom? Our vision is that both rural and urban human settlements will increasingly contribute to their respective food security. More data are required for a solid prediction.

### ***Health and Nutrition***

Agroterrorism is *not* a trend, but the recent anthrax attacks require considering agroterrorism in 21st century agriculture as a possibility on any scale — from global to an urban setting. Food, animals, or biogenetically engineered organisms could all be vectors. Disruption of food systems is another realistic possibility. In 2000, the U.S. Centers for Disease Control and Prevention cited botulism, salmonella, E. coli, and cholera as potential threats because they may be produced in ways that are relatively fast, inexpensive, and easily concealed.<sup>38</sup> The decades-long trend to a oligopolistic

transportation-linked agro-food system contributes to the potential for disastrous terrorist assaults on urban food systems. A decentralized production system, with a redundant communications networks, may provide some insurance against terrorist attacks on food quantity and quality.

Many safe agricultural practices of our parents are less safe today. The increasing use of chemicals in industrial processes, construction, and agriculture require more stringent management practices. In some countries (China, France, USA), it is resulting in the outright ban of some practices, including ancient ones. Higher spatial integration of settlements and farms within intra-urban and particularly peri-urban areas create a living environment that is more likely to spread contamination and related diseases.

During the 1970s and 1980s, progress was made in reducing malnutrition and starvation in the world. During the 1990s, a decade of relative economic prosperity, malnutrition and starvation increased, particularly in urban areas, in part because the poor lacked regular access to the more-than-adequate global food supply.<sup>39</sup>

The nutritional contribution of urban agriculture is an important component in the trend to a broader understanding of *urban nutrition*. As attention shifts to the contribution of community-based agriculture, the future is likely to include thinking in terms of *urban food systems*, with urban agriculture increasingly viewed as integral to such systems.

Since the United Nations Earth Summit in 1992, there is an increasing acceptance of the need to soften and green the urban environment. Two trends in this direction include recycling waste and building lower-density human settlements.

A third trend that takes advantage of the first two is urban agriculture — it embraces the new lower-density city and recycles waste as an input. Many more surveys in diverse settings are needed to measure the benefits of these three trends. Certainly cities that have seen dramatic increases in urban agriculture, such as Havana and Baghdad, are healthier places to live in 2000 than they were in 1990. The health benefits of food production within the human settlement can be summarized:

- Better access and availability to good food for all; access through barter, self-production, and/or purchase.
- More vitamins and other essential micronutrients available per unit of food.
- Better access to protein at reduced cost to low-income families.
- Cleaner and healthier living environment.

### Special Groups

In Chapter 3, we identified a number of groups of urban farmers that call for special discussion, including youth, migrants, crisis farmers, etc. This chapter highlights two groups — women, and refugees and displaced persons.

#### **Women**

Urban agriculture in many countries is women's agriculture. Maxwell and Zziwa discovered in Kampala, Uganda (and others confirmed elsewhere) the core truth that the children of urban women farmers are healthier than the children of their neighbors who



do not farm but have the same income.<sup>40</sup> Food security and related health are enhanced when women farm. And the chief farmer in the city is more likely to be a woman than the farmer in the country. There is some evidence of a general trend toward women being the farmer in charge not only in Africa and Latin America, but also in Europe and North America.

The trend toward women farmers is consistent with the global advance of women toward equality and the global trend toward urbanization and smaller farms. This trend seems likely to continue for another generation, improving food security and health.

### ***Refugees and Displaced Persons***

The UN High commissioner for Refugees and the International Committee of the Red Cross concur in forecasting ever greater millions of refugees (inside and outside national borders) during the next 20 to 30 years. Fifty million is a common figure cited for 2000, with about one-half being so-called environmental refugees. Such refugees include those affected by natural disasters or environmental degradation due to development. Internally displaced persons (IDPs) are currently estimated at over 20 million worldwide (see Case 7.4). In sub-Saharan Africa alone, an estimated 12 million refugees, returnees, and IDPs needed assistance in 2000.<sup>41</sup>

A large percentage of refugees and IDPs spend time living in camps or other quasi-urban settings. Such locales have proven in the past to be receptive and conducive to urban agriculture practices. Food production by refugees and displaced persons is now referred to — and is starting to be recognized — as *food-based nutrition intervention* and as *emergency agriculture* by actors in the field.<sup>42</sup>

Crop failure in rural agriculture commonly creates refugees or displaced persons. As the number of refugees in the world increases — from both civil strife and natural disasters — much more rapidly than the population, emergency agriculture using urban agriculture technology may become more prominent. Emergency agriculture will be increasingly appropriate for the growing number of longer-term refugees because the duration, not just the number, of refugees is trending upward worldwide. The acceleration of agriculture among refugees and IDPs will depend on the role of relief organizations that help community groups feed themselves, particularly women and youth.

### **Waste Management and Nutrient Cycling**

Urbanization and economic growth both generate increased waste per person. As cities grow and prosper, waste increases more rapidly than the population because wealthier people generate more waste per capita. The reuse of waste as an input to urban food production is a clear and growing advantage of urban agriculture over rural, particularly as rural natural resources continue to be depleted.

The trend in the past few years has been for the well-developed organic urban waste-to-food methodologies of China and other Asian nations to spread worldwide. The recent transformation of Cuba's agriculture, beginning with a Chinese biointensive model, is a case in point.<sup>43</sup> The French biointensive production methods, originally attributable to the Marais district of Paris, has been adapted in California, Manila, and many other places.

These and other approaches based on intensive and controlled nutrient cycling (such as permaculture) are likely to continue spreading indefinitely. We have described the waste-to-food technology and future prospects in Chapters 5 and 7.

Composting organic waste has in the past three decades been made more efficient. The technology of maintaining optimum temperature and moisture has cut the time of processing, as has the use of efficient aerobic and anaerobic microbes. Technologies today range from composting at the kitchen sink to multi-acre sites. Vermi-composting, using the digestive tracts of worms, has made advances worldwide.<sup>44</sup>

At the same time, the ecological processing of wastewater has made significant advances. Again, this up-graded technology can be applied at small and large scales. Clearly such waste technology benefits both rural and urban producers, but the urban producer is closer to the waste source.

Some of the current advantages of urban agriculture over rural will diminish as the recycling programs of many cities reduce the availability and access to some types of waste, including paper, which today serve as inputs for urban farmers. In many places, legally or procedurally placing the farmer above rather than below the dump or landfill will improve the waste-to-food process and nutrient cycle.

The most worrisome trend may be the increasing presence of contaminants (toxins, heavy metals, hospital waste) in the waste of countries with less advanced waste management systems. At the same time, controls and enforcement on the content and disposal of waste are increasing in more and more countries. These twin trends may mean that recycling waste into urban agriculture may become increasingly challenging or hazardous in developing countries, yet more feasible in developed countries. This trend would reverse the longstanding situation of the past century.

Increasing hazards in some cases, and the growing perception of hazards in others, may push policymakers toward becoming overcautious in the reuse of waste in some countries. This makes certain practices (distribution of compost to farmers, use of sludge in organic agriculture) increasingly difficult to realize.

During the entire 20th century, there has been a trend to larger and more remote solid waste dumps and sewage treatment facilities. It is not uncommon in the 1990s for family household waste to be shipped 200 miles (300 kilometers) or more. In 1998, a European country seriously proposed shipping garbage to India. The United Nations University and a dozen other organizations are rediscovering and reinventing community-based waste treatment facilities.<sup>45</sup> In developing countries, construction of roads radiating from main cities is encouraging waste disposal at greater distances. In some cases, this benefits peri-urban agriculture, but in many others, it removes some city waste and dumps it far away rather than cycling the nutrients.<sup>46</sup>

## Research and Support

The significance of urban agriculture as a development intervention finally became widely recognized by the end of the 1990s. It was a slow process of publication in somewhat obscure journals and newsletters, presentations at conferences and workshops and development of websites.

The same period finds aid for urban agriculture increasing while overall development aid is declining. The Support Group on Urban Agriculture (SGUA), formed in 1996, has grown from the original 14 to 26 members, including many of the major players in international development. Projects are being funded by development banks (AfDB, IBRD, IDB) the European Union, and many bilateral programs (Canada, UK, Netherlands, Japan, Germany, Sweden, France, Italy, Switzerland, Taiwan, Belgium). The United Nations family is deeply engaged (UNDP, UNICEF, WHO, FAO, UNCHS, UNU, WFP). Many civic sector organizations (Africare, CARE, SAVE, Oxfam, AFSC, Helen Keller, Mennonites, World Vision, IRC, Heifer International) are also conducting urban agriculture projects.

SGUA is operating a listserv, conducting electronic conferences, publishing a magazine, and assembling a database. Through its training branch (AGRICOLA) it is providing scholarships to practitioners and students worldwide. Its information website, [www.cityfarmer.org](http://www.cityfarmer.org), is the premier Internet source for information in the field (10,000 hits each day). Membership is open to organizations by invitation.

The increase in international aid to urban agriculture is not only a financial increase, but also a broadening of support. During the 1950s to 1980s, support was largely limited to household gardens and school garden projects. In the 1990s such aid included refugee food security and commercial production, hydroponics, forestry, aquaculture, waste reuse, community kitchens, farmers' markets, and much more.

In 1999 the Consultative Group on International Agriculture Research (CGIAR) adopted a well-funded initiative in urban agriculture, the Strategic Initiative in Urban and Peri-Urban Agriculture (SIUPA). This begins to enroll 14 centers with about 100 locations in more than 40 countries into urban agriculture research. The Asian Vegetable Research and Development Center (AVRDC) in Taiwan has been researching urban agriculture for decades. Most urban agriculture research in the past has been under such titles as poultry, biointensive horticulture, zero grazing, community forestry, or other farming method titles, without being distinguished specifically as urban agriculture. As policy shifts occur to favor urban agriculture, such as in Russia, South Africa, and Cuba, research is likely to follow.

National support for urban agriculture has both preceded and followed the international programs described earlier in both text and cases in other chapters. Since 1996, in the USA there have been several grants from the USDA to NGOs committed to food security. In Germany, a policy change in 2000 favored environmentally friendly agricultural production methods. The government of South Africa has supported urban food production from the day it assumed office. Cuba adopted a pro-urban agriculture program in 1993. Argentina started the Pro Huerta (small-scale production) program in 1992 and has expanded it several times. Ghana's Operation Feed Yourself in the 1970s was a great success. Malaysia's response to the 1990s economic downturn was to support urban food production. Romania, perhaps following Cuba's lead, adopted pro-urban agriculture programs in 1994. Thus in a somewhat diverse set of support activities, rich, poor, and in-between nations are supporting urban agriculture.

Many states, provinces, and municipalities support urban agriculture. Eighty thousand Berliners farm on city-supported community gardens. There are over 1,000 community

gardens in New York City. Districts and municipalities in greater Paris support urban farmers. Mexico City provides extension services and protects farmers right to farm. In Amman, Jordan, idle land is open to cropping or grazing on a year-to-year basis. Calcutta makes its central park and retired garbage dumps available to its farmers. Jakarta leases its reservoirs to small-scale fishermen. Rio de Janeiro and Los Angeles lease land under their electric lines to farmers at below market rates. Examples abound, and there is a need to exchange best practices.

It is somewhat predictable that the increasing adoption of the food security concept, combined with an acceptance of the inevitability of urbanization, will stimulate urban agriculture research as a source of good food for the poor. At the same time, increasing concern for a livable environment, resource conservation, and a sustainable way of life will promote systems analysis that is bound to sooner or later discover the potential of urban agriculture as a means to reduce pollution and green the environment. Water shortages and increasing energy costs could stimulate urban agriculture and research at the food-energy nexus and the food-water nexus.

University research has to a substantial degree been led by student demand, particularly master's degree candidates. Many of these students have been women from developing countries who know and recognize the issues and possibilities. The disciplines include geography, sociology, urban studies, public health, and environment as well as agricultural specialties. We dare to optimistically predict that educators will begin to set policies and programs to fit student demand.

## Conclusion

All of the trends presented here will have either favorable or unfavorable effects on urban agriculture — sometimes both simultaneously. The data to support this forecast are legitimate, but are uneven and not comparable across city or national borders. More reliable forecasts and predictions await the adoption of common indicators and much more data collection. There is a large role for the application of best practices and appropriate policies from one place to many others, indeed, to apply the positive trends and counter the negative.

The strength of the overall trends in urban agriculture, the pace at which they move, and even the directions they may take remain to be seen over the next years and decades. Meanwhile, based on our best ability to understand trends and make forecasts, appropriate policies and instruments need to be continually developed for many different contexts. These will be the subject of the final chapter.

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